

## SEQUENCE LISTING

&lt;110&gt; BASF Aktiengesellschaft

&lt;120&gt; GMP synthetase from plants

&lt;130&gt; DE 19947490.7

&lt;140&gt; 0050-50777

&lt;141&gt; 1999-10-01

&lt;160&gt; 4

&lt;170&gt; PatentIn Vers. 2.0

&lt;210&gt; 1

&lt;211&gt; 1973

&lt;212&gt; DNA

&lt;213&gt; Nicotiana tabacum

&lt;220&gt;

&lt;221&gt; CDS

&lt;222&gt; (65)..(1678)

&lt;400&gt; 1

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Met Glu Pro Gln Thr Gln Ala Lys Lys Ser Asn Leu Val Leu Ile

1 5 10 15

cta gac tac ggt tct cag tac act cac cta atc acc cgc cga atc cga 157

Leu Asp Tyr Gly Ser Gln Tyr Thr His Leu Ile Thr Arg Arg Ile Arg

20 25 30

agc cta tca att ttc tca ctc acc att aac ggc acc tct tcg tta gac 205

Ser Leu Ser Ile Phe Ser Leu Thr Ile Asn Gly Thr Ser Ser Leu Asp

35 40 45

tcc ata aaa gaa ctc gac cca cgt gtc att atc ctc tcg ggt gga ccc 253

Ser Ile Lys Glu Leu Asp Pro Arg Val Ile Ile Leu Ser Gly Gly Pro

50 55 60

cac agc gtc cac gct gac ggc gca ccg tgt ttc cca cct ggg ttc atc 301

His Ser Val His Ala Asp Gly Ala Pro Cys Phe Pro Pro Gly Phe Ile

65 70 75

gaa tac gtc gag tca cgt ggg att cac gtg ttg ggt ata tgt tat ggg 349

Glu Tyr Val Glu Ser Arg Gly Ile His Val Leu Gly Il Cys Tyr Gly  
80 85 90 95

ctg cag ttg att gtt cag aaa ctt ggc ggg gtt gtg aaa att gga gag 397  
Leu Gln Leu Ile Val Gln Lys Leu Gly Gly Val Val Lys Ile Gly Glu  
100 105 110

aaa cat gag tat ggg aga atg gaa att gag gtt gga aag aat gtt gtt 445  
Lys His Glu Tyr Gly Arg Met Glu Ile Glu Val Gly Lys Asn Val Val  
115 120 125

ggg ggg ttg ttt ggg aat acg gaa att ggt gat aaa cag gtg gtt tgg 493  
Gly Gly Leu Phe Gly Asn Thr Glu Ile Gly Asp Lys Gln Val Val Trp  
130 135 140

atg agc cac ggt gat gag gct gtg aaa ttg ccg gaa ggg ttt gag gtt 541  
Met Ser His Gly Asp Glu Ala Val Lys Leu Pro Glu Gly Phe Glu Val  
145 150 155

gtg gcg agg agt agt cag ggt gct gtt gct gct att gag aat cgg gaa 589  
Val Ala Arg Ser Ser Gln Gly Ala Val Ala Ala Ile Glu Asn Arg Glu  
160 165 170 175

ccg agg ttt tat ggg ctg cag tat cat ccc gag gta acg cac tcg act 637  
Arg Arg Phe Tyr Gly Leu Gln Tyr His Pro Glu Val Thr His Ser Thr  
180 185 190

gaa ggg atg aga aca tta aga cac ttt ctg ttt gat gta tgt ggc gtt 685  
Glu Gly Met Arg Thr Leu Arg His Phe Leu Phe Asp Val Cys Gly Val  
195 200 205

aca gct ggc tgg aag atg gaa gat gtt ctg gag gaa gaa ata aaa gtt 733  
Thr Ala Gly Trp Lys Met Glu Asp Val Leu Glu Glu Glu Ile Lys Val  
210 215 220

atc aaa ggt atg gtt gga cct gaa gat cac gtg att tgt gct tta tct 781  
Ile Lys Gly Met Val Gly Pro Glu Asp His Val Ile Cys Ala Leu Ser  
225 230 235

ggt ggt gtt gat tcc aca gtt gca gct aaa ttg gta cac aag gct atc 829  
Gly Gly Val Asp Ser Thr Val Ala Ala Lys Leu Val His Lys Ala Ile  
240 245 250 255

ggg gac agg ctt cac tgt gtt ttt gtt gat aat ggt cta tta agg tat 877  
Gly Asp Arg Leu His Cys Val Phe Val Asp Asn Gly Leu Leu Arg Tyr  
260 265 270

aag gag aga gaa agg gtg atg gaa ctc ttt gag aag cgc ctt cat ttg 925

Lys Glu Arg Glu Arg Val Met Glu Leu Phe Glu Lys Arg L u His Leu  
 275 280 285

cct gtt acc tgt gtc gat gct aca gaa gaa ttt ctc agc aaa cta aaa 973  
 Pro Val Thr Cys Val Asp Ala Thr Glu Glu Phe Leu Ser Lys Leu Lys  
 290 295 300

ggc gta aca gaa cct gaa atg aag agg aaa ata att ggg aag gag ttc 1021  
 Gly Val Thr Glu Pro Glu Met Lys Arg Lys Ile Ile Gly Lys Glu Phe  
 305 310 315

atc aac ata ttt gat ctt ttt gcc cat gat gtg gag gaa aaa gta ggg 1069  
 Ile Asn Ile Phe Asp Leu Phe Ala His Asp Val Glu Glu Lys Val Gly  
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aaa aaa cct agt tac cta gtc caa gga acc ttg tat cct gat gta ata 1117  
 Lys Lys Pro Ser Tyr Leu Val Gln Gly Thr Leu Tyr Pro Asp Val Ile  
 340 345 350

gag tct tgt cct cca cct gga agt gga aga aca cat tct cat aca atc 1165  
 Glu Ser Cys Pro Pro Pro Gly Ser Gly Arg Thr His Ser His Thr Ile  
 355 360 365

aag agc cat cat aat gtt gga ggt ctt cca aag gac atg aag ctg aag 1213  
 Lys Ser His His Asn Val Gly Gly Leu Pro Lys Asp Met Lys Leu Lys  
 370 375 380

ctc atc gag cca ctg aaa ctt cta ttc aag gat gag gtt cgt gaa ttg 1261  
 Leu Ile Glu Pro Leu Lys Leu Leu Phe Lys Asp Glu Val Arg Glu Leu  
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gga aag att ttg gat ata tct gag gac ttt ctt aaa cgc cac ccg ttc 1309  
 Gly Lys Ile Leu Asp Ile Ser Glu Asp Phe Leu Lys Arg His Pro Phe  
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cct ggg ccc gga ctc gct gtg cga att cca ggt gat gtc aca gca ggg 1357  
 Pro Gly Pro Gly Leu Ala Val Arg Ile Pro Gly Asp Val Thr Ala Gly  
 420 425 430

aat tcc ttg gat att ctt cgt cag gtt gat gaa atc ttc att caa tca 1405  
 Asn Ser Leu Asp Ile Leu Arg Gln Val Asp Glu Ile Phe Ile Gln Ser  
 435 440 445

atc aga gat gct aaa atc tat gat gaa ata tgg caa gct ttt gct gtc 1453  
 Ile Arg Asp Ala Lys Ile Tyr Asp Glu Ile Trp Gln Ala Phe Ala Val  
 450 455 460

ttc tta cca gtg aaa act gtt gga gta caa gga gac caa aga acc cat 1501

Phe Leu Pro Val Lys Thr Val Gly Val Gln Gly Asp Gln Arg Thr His  
 465 470 475

tcc cac gct gtt gca ctt aga gca gtc aca agt caa gat gga atg act 1549  
 Ser His Ala Val Ala Leu Arg Ala Val Thr Ser Gln Asp Gly Met Thr  
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gca gac tgg tac tac ttt gat ttc aag ttc ctt gac gac gta tca aga 1597  
 Ala Asp Trp Tyr Tyr Phe Asp Phe Lys Phe Leu Asp Asp Val Ser Arg  
 500 505 510

aag atc tgc aat agt gtt cgt ggt gta aat cga gtt ctg ctg gat att 1645  
 Lys Ile Cys Asn Ser Val Arg Gly Val Asn Arg Val Leu Leu Asp Ile  
 515 520 525

aca tca aag cct cca tca aca atc gaa tgg gaa taatttgta taaagaatgc 1698  
 Thr Ser Lys Pro Pro Ser Thr Ile Glu Trp Glu  
 530 535

tatatttggt gaccaaagta ggattctttt gtgatttttg gtgcataaca aaaaggaaga 1758

aatcataat agaaatttag gtccttttgt tatgtggtag aactggttct tgggtaatta 1818

gtgcaatgc totcaacaat tttgtatggt tatgggtatg atgataccaa attttactca 1878

gatcttggtg gtacattttt cttatccaag tatagtaaca tgtggccagg catcaaaaagc 1938

ctattccact caaaaaaaaa aaaaaaaaaac tcgag 1973

<210> 2

<211> 538

<212> PRT

<213> Nicotiana tabacum

<400> 2

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Leu Ser Ile Phe Ser Leu Thr Ile Asn Gly Thr Ser Ser Leu Asp Ser  
 35 40 45

Ile Lys Glu Leu Asp Pro Arg Val Ile Ile Leu Ser Gly Gly Pro His  
 50 55 60

0050/50777

Ser Val His Ala Asp Gly Ala Pro Cys Phe Pro Pro Gly Phe Ile Glu  
65 70 75 80

Tyr Val Glu Ser Arg Gly Ile His Val Leu Gly Ile Cys Tyr Gly Leu  
85 90 95

Gln Leu Ile Val Gln Lys Leu Gly Gly Val Val Lys Ile Gly Glu Lys  
100 105 110

His Glu Tyr Gly Arg Met Glu Ile Glu Val Gly Lys Asn Val Val Gly  
115 120 125

Gly Leu Phe Gly Asn Thr Glu Ile Gly Asp Lys Gln Val Val Trp Met  
130 135 140

Ser His Gly Asp Glu Ala Val Lys Leu Pro Glu Gly Phe Glu Val Val  
145 150 155 160

Ala Arg Ser Ser Gln Gly Ala Val Ala Ala Ile Glu Asn Arg Glu Arg  
165 170 175

Arg Phe Tyr Gly Leu Gln Tyr His Pro Glu Val Thr His Ser Thr Glu  
180 185 190

Gly Met Arg Thr Leu Arg His Phe Leu Phe Asp Val Cys Gly Val Thr  
195 200 205

Ala Gly Trp Lys Met Glu Asp Val Leu Glu Glu Glu Ile Lys Val Ile  
210 215 220

Lys Gly Met Val Gly Pro Glu Asp His Val Ile Cys Ala Leu Ser Gly  
225 230 235 240

Gly Val Asp Ser Thr Val Ala Ala Lys Leu Val His Lys Ala Ile Gly  
245 250 255

Asp Arg Leu His Cys Val Phe Val Asp Asn Gly Leu Leu Arg Tyr Lys  
260 265 270

Glu Arg Glu Arg Val Met Glu Leu Phe Glu Lys Arg Leu His Leu Pro  
275 280 285

Val Thr Cys Val Asp Ala Thr Glu Glu Phe Leu Ser Lys Leu Lys Gly  
290 295 300

Val Thr Glu Pro Glu Met Lys Arg Lys Ile Ile Gly Lys Glu Phe Ile  
305 310 315 320

Asn Ile Phe Asp Leu Phe Ala His Asp Val Glu Glu Lys Val Gly Lys  
 325 330 335

Lys Pro Ser Tyr Leu Val Gln Gly Thr Leu Tyr Pro Asp Val Ile Glu  
 340 345 350

Ser Cys Pro Pro Gly Ser Gly Arg Thr His Ser His Thr Ile Lys  
 355 360 365

Ser His His Asn Val Gly Gly Leu Pro Lys Asp Met Lys Leu Lys Leu  
 370 375 380

Ile Glu Pro Leu Lys Leu Leu Phe Lys Asp Glu Val Arg Glu Leu Gly  
 385 390 395 400

Lys Ile Leu Asp Ile Ser Glu Asp Phe Leu Lys Arg His Pro Phe Pro  
 405 410 415

Gly Pro Gly Leu Ala Val Arg Ile Pro Gly Asp Val Thr Ala Gly Asn  
 420 425 430

Ser Leu Asp Ile Leu Arg Gln Val Asp Glu Ile Phe Ile Gln Ser Ile  
 435 440 445

Arg Asp Ala Lys Ile Tyr Asp Glu Ile Trp Gln Ala Phe Ala Val Phe  
 450 455 460

Leu Pro Val Lys Thr Val Gly Val Gln Gly Asp Gln Arg Thr His Ser  
 465 470 475 480

His Ala Val Ala Leu Arg Ala Val Thr Ser Gln Asp Gly Met Thr Ala  
 485 490 495

Asp Trp Tyr Tyr Phe Asp Phe Lys Phe Leu Asp Asp Val Ser Arg Lys  
 500 505 510

Ile Cys Asn Ser Val Arg Gly Val Asn Arg Val Leu Leu Asp Ile Thr  
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Ser Lys Pro Pro Ser Thr Ile Glu Trp Glu  
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<210> 3

<211> 1232

<212> DNA

<213> Physcomitrella patens

&lt;220&gt;

&lt;221&gt; CDS

&lt;222&gt; (3)..(1148)

&lt;400&gt; 3

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gaa aat gtg gat tcc aga atc tac gcc ctc caa tac cat ccc gag gtt 95  
 Glu Asn Val Asp Ser Arg Ile Tyr Ala Leu Gln Tyr His Pro Glu Val  
 20 25 30

acg cac tca gag aaa ggg aca gag act ttg aga cac ttt ttc ctg aat 143  
 Thr His Ser Glu Lys Gly Thr Glu Thr Leu Arg His Phe Phe Leu Asn  
 35 40 45

ctc tgc ggc atg aag gct gac tgg cag atg cag aat gtg ttg gag gaa 191  
 Val Cys Gly Met Lys Ala Asp Trp Gln Met Gln Asn Val Leu Glu Glu  
 50 55 60

gag att aaa aag gtc act gcg acc gtc ggc cca gat gat cat gtt att 239  
 Glu Ile Lys Lys Val Thr Ala Thr Val Gly Pro Asp Asp His Val Ile  
 65 70 75

tgt gca ctc tcc ggg ggc gtg gac tca aca gta gca gct act ctg gtg 287  
 Cys Ala Leu Ser Gly Gly Val Asp Ser Thr Val Ala Ala Thr Leu Val  
 80 85 90 95

cac cgt gct att gga gat cgc ctt cat tgt gtg ttt gta gat aat ggc 335  
 His Arg Ala Ile Gly Asp Arg Leu His Cys Val Phe Val Asp Asn Gly  
 100 105 110

ctt tgc aga tac aag gaa aga gaa aga gtg atg gcc aca ttt gtg aaa 383  
 Leu Cys Arg Tyr Lys Glu Arg Glu Arg Val Met Ala Thr Phe Val Lys  
 115 120 125

gac ctt cat ctg cca gtc act tgt gtg gat gcc act gag cag ttt ctc 431  
 Asp Leu His Leu Pro Val Thr Cys Val Asp Ala Thr Glu Gln Phe Leu  
 130 135 140

agc aaa ttg aag ggc gtg gta gat cca gag aga aag agg aag atc atc 479  
 Ser Lys Leu Lys Gly Val Val Asp Pro Glu Arg Lys Arg Lys Ile Ile  
 145 150 155

gga gca gag ttt att gca gtc ttt gat gaa ttt tcg cac aga ttg gag 527  
 Gly Ala Glu Ph Ile Ala Val Ph Asp Glu Phe Ser His Arg Leu Glu  
 160 165 170 175

100880027-001402

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Arg Glu Ile Gly Lys Met Pro Ala Phe Leu Val Gln Gly Thr Leu Tyr	
180 185 190	
cca gat gtc att gag tcg tgt cct cct cca ggg agc ggg aag tcg cat	623
Pro Asp Val Ile Glu Ser Cys Pro Pro Pro Gly Ser Gly Lys Ser His	
195 200 205	
tcc cac aca atc aaa agt cat cac aac gtc ggt ggc ttg ccc gag aac	671
Ser His Thr Ile Lys Ser His His Asn Val Gly Gly Leu Pro Glu Asn	
210 215 220	
atg aaa ttg aag ttg gtt gag cct ctc aag tgg ctc ttc aaa gac gag	719
Met Lys Leu Lys Leu Val Glu Pro Leu Lys Trp Leu Phe Lys Asp Glu	
225 230 235	
gta cgc gaa atg ggt gca ttg ttg gat gta cct gtt tcc ttt ttg aag	767
Val Arg Glu Met Gly Ala Leu Leu Asp Val Pro Val Ser Phe Leu Lys	
240 245 250 255	
cgc cat cct ttc cct gga cct gga ttg gcc gtg cga att ctt ggg gat	815
Arg His Pro Phe Pro Gly Pro Gly Leu Ala Val Arg Ile Leu Gly Asp	
260 265 270	
gta act cag gac ggc gca ctc gac act atc cgc ttg gtt gat gag atc	863
Val Thr Gln Asp Gly Ala Leu Asp Thr Ile Arg Leu Val Asp Glu Ile	
275 280 285	
ttt gtg aac agc att cga gag gca ggt ctt tac gat aag atc tgg cag	911
Phe Val Asn Ser Ile Arg Glu Ala Gly Leu Tyr Asp Lys Ile Trp Gln	
290 295 300	
gca ttt gct gtt tat ctg cca gta aag act gtt ggc gtt caa ggc gac	959
Ala Phe Ala Val Tyr Leu Pro Val Lys Thr Val Gly Val Gln Gly Asp	
305 310 315	
aaa cgg aca cat tca cac gct gtt gct cta cgt gca att aca agt gaa	1007
Lys Arg Thr His Ser His Ala Val Ala Leu Arg Ala Ile Thr Ser Glu	
320 325 330 335	
gac gga atg act gct gac tgg ttt cat ttt gat gga aag ttt ctt gcc	1055
Asp Gly Met Thr Ala Asp Trp Phe His Phe Asp Gly Lys Phe Leu Ala	
340 345 350	
gag gta tca tct aaa atc tgc aac agc gta agg ggt atc aat agg gtg	1103
Glu Val Ser Ser Lys Ile Cys Asn Ser Val Arg Gly Ile Asn Arg Val	
355 360 365	



gta tac gac att acg tct aaa cct cca tca act gtt gag tgg gaa 1148  
 Val Tyr Asp Ile Thr Ser Lys Pro Pro Ser Thr Val Glu Trp Glu  
 370 375 380

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 <211> 382  
 <212> PRT  
 <213> Physcomitrella patens

<400> 4

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 His Ser Glu Lys Gly Thr Glu Thr Leu Arg His Phe Phe Leu Asn Val  
 35 40 45  
 Cys Gly Met Lys Ala Asp Trp Gln Met Gln Asn Val Leu Glu Glu Glu  
 50 55 60  
 Ile Lys Lys Val Thr Ala Thr Val Gly Pro Asp Asp His Val Ile Cys  
 65 70 75 80  
 Ala Leu Ser Gly Gly Val Asp Ser Thr Val Ala Ala Thr Leu Val His  
 85 90 95  
 Arg Ala Ile Gly Asp Arg Leu His Cys Val Phe Val Asp Asn Gly Leu  
 100 105 110  
 Cys Arg Tyr Lys Glu Arg Glu Arg Val Met Ala Thr Phe Val Lys Asp  
 115 120 125  
 Leu His Leu Pro Val Thr Cys Val Asp Ala Thr Glu Gln Phe Leu Ser  
 130 135 140  
 Lys Leu Lys Gly Val Val Asp Pro Glu Arg Lys Arg Lys Ile Ile Gly  
 145 150 155 160  
 Ala Glu Phe Ile Ala Val Phe Asp Glu Phe Ser His Arg Leu Glu Arg  
 165 170 175

Glu Ile Gly Lys Met Pro Ala Phe Leu Val Gln Gly Thr Leu Tyr Pro  
180 185 190

Asp Val Ile Glu Ser Cys Pro Pro Pro Gly Ser Gly Lys Ser His Ser  
195 200 205

His Thr Ile Lys Ser His His Asn Val Gly Gly Leu Pro Glu Asn Met  
210 215 220

Lys Leu Lys Leu Val Glu Pro Leu Lys Trp Leu Phe Lys Asp Glu Val  
225 230 235 240

Arg Glu Met Gly Ala Leu Leu Asp Val Pro Val Ser Phe Leu Lys Arg  
245 250 255

His Pro Phe Pro Gly Pro Gly Leu Ala Val Arg Ile Leu Gly Asp Val  
260 265 270

Thr Gln Asp Gly Ala Leu Asp Thr Ile Arg Leu Val Asp Glu Ile Phe  
275 280 285

Val Asn Ser Ile Arg Glu Ala Gly Leu Tyr Asp Lys Ile Trp Gln Ala  
290 295 300

Phe Ala Val Tyr Leu Pro Val Lys Thr Val Gly Val Gln Gly Asp Lys  
305 310 315 320

Arg Thr His Ser His Ala Val Ala Leu Arg Ala Ile Thr Ser Glu Asp  
325 330 335

Gly Met Thr Ala Asp Trp Phe His Phe Asp Gly Lys Phe Leu Ala Glu  
340 345 350

Val Ser Ser Lys Ile Cys Asn Ser Val Arg Gly Ile Asn Arg Val Val  
355 360 365

Tyr Asp Ile Thr Ser Lys Pro Pro Ser Thr Val Glu Trp Glu  
370 375 380